Docket No.: BU9-98-183-US2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Agnello, et al. Examiner: Vu, Hung K.

Serial No.: 09/939,895 Art Unit: 2811

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Title: **WET CLEANS FOR COBALT DISILICIDE PROCESSING**

Commissioner for Patents
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BRIEF OF APPELLANT

This Reply Brief addresses issues in the Examiner's Answer mailed April 18, 2006.

GROUND OF REJECTION 1

Claims 27, 33-34 and 39-44 stand rejected under 35 U.S.C. §102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. §103(a) as allegedly obvious over Raaijmakers (U.S. Patent 4,908,331).

Appellants respectfully contend that claims 27 and 34 are not unpatentable over Raaijmakers under 35 U.S.C. §102(b) or 35 U.S.C. §103(a), because Raaijmakers does not teach or suggest each and every feature of claims 27 and 34.

A first example of why claims 27 and 34 are not unpatentable over Raaijmakers is that Raaijmakers does not teach or suggest the feature:"wherein the layer of cobalt disilicide is in contact with a reagent comprising water, ammonium hydroxide, and hydrogen peroxide" (claim 27); and "wherein the first layer of cobalt disilicide, the second layer of cobalt disilicide, and the third layer of cobalt disilicide are each in contact with a reagent comprising water, ammonium hydroxide, and hydrogen peroxide" (claim 34).

The Examiner's Answer does not even allege that and Raaijmakers teaches or suggests the preceding feature of claims 27 and 34. Instead, the Examiner's Answer argues that:

> "The terms "the layer of cobalt disilicide is in contact with a reagent comprising water, ammonium hydroxide, and hydrogen peroxide", "not adapted to chemically react", "4 percent of a total reagent volume of the reagent" and temperature with a range of about 45 degrees Celsius to about 95 degrees Celsius" are method recitations in a device claimed. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process

claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe,* 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). Also note that at the final structure, as shown in Figures 10 and 18 of the present invention, there is no reagent in contact with the cobalt disilicide. Therefore the limitation of reagent is really recited in the intermediate step of forming the cobalt disilicide."

In response, Appellants contend that the preceding limitation of claims 27 and 34 is not a product by process limitation. Claims 27 and 34 are claiming a structure and the preceding limitation ("wherein the layer of cobalt disilicide is in contact with a reagent comprising water, ammonium hydroxide, and hydrogen peroxide") is a structural limitation of the claimed structure. The preceding limitation of claims 27 and 34 does not describe a process by which any claimed product is formed.

In "Response to Arguments", the Examiner's Answer argues that

"at the final structure, as shown in Figures 10 and 18 of the present invention, there is no reagent in contact with the cobalt disilicide. Therefore, the limitation of "the layer of cobalt disilicide is in contact with a reagent" is really recited in the intermediate step of forming the cobalt disilicide. As the result, the term "the layer of cobalt disilicide is in contact with a reagent comprising water, ammonium hydroxide, and hydrogen peroxide" is method recitation in a device claimed. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe,* 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)."

In response, Appellants acknowledge that the structure recited in claims 27 and 34 is an intermediate structure. However, Appellents are not claiming the preceding feature ("wherein the layer of cobalt disilicide is in contact with a reagent comprising water, ammonium hydroxide, and hydrogen peroxide") as a process limitation of a final structure but rather as a structural limitation of the recited intermediate structure. Appellants respectfully point out that claims 27 and 34 do not claim a final structure, do not claim a process, and do not recite any active method steps of a process. The intermediate structure being claimed in claims 27 and 34 is described in Appellants' specification on page 9, lines 12-18.

The fact that the intermediate structure claimed in claims 27 and 34 is described in the specification to be present in a process step directed to forming the final structure shown in FIG. 10 does not imply that the intermediate structure is being claimed as a process limitation. Appellants note that claims 27 and 34 do not recite the final structure shown in FIG. 10 and claims 27 and 34 do not recite any active method steps performed to generate the final structure shown in FIG. 10. Claims 27 and 34 are drawn to a structure subject to the structural limitation of "wherein the layer of cobalt disilicide is in contact with a reagent comprising water, ammonium hydroxide, and hydrogen peroxide".

To further clarify the issue, Appellants respectfully suggest that the preceding claimed limitation ("wherein the layer of cobalt disilicide is in contact with a reagent comprising water, ammonium hydroxide, and hydrogen peroxide") would be a process limitation in a product-by-process claim for a claim drawn to the final structure depicted in FIG. 10 subject to being formed by a process comprising the preceding claimed limitation. However, the language claims 27 and 34 is not drawn to the final structure depicted in FIG. 10 but is rather drawn to the intermediate

strucure described in Appellants' specification on page 9, lines 12-18.

A second example of why claims 27 and 34 are not unpatentable over Raaijmakers is that Raaijmakers does not teach or suggest the feature:"wherein there is essentially no stringer of an oxide of titanium on the layer of cobalt disilicide" (claim 27); and "a second layer of cobalt disilicide ..., and said second layer having essentially no stringer of an oxide of titanium thereon" (claim 34)".

The Examiner argues: "In the absence of evidence to the contrary it is held that there is no oxide of titanium on the layer of cobalt disilicide. Therefore, there won't be any stringer of an oxide of titanium on the layer of cobalt disilicide."

In response, Appellants contend that the Examiner has not applied a correct legal test for determining whether or not teaches or suggests the feature:"wherein there is essentially no stringer of an oxide of titanium on the layer of cobalt disilicide".

Under 35 U.S.C. §102(b), the correct legal test is whether Raaijmakers explicitly or inherently teaches or suggests the feature:"wherein there is essentially no stringer of an oxide of titanium on the layer of cobalt disilicide". Appellants contend that Raaijmakers does not explicitly teach said feature, and the Examiner has not alleged that Raaijmakers explicitly teaches said feature.

Appellants contend that Raaijmakers does not inherently teach said feature, since under case law, the alleged inherency must **necessarily and inevitably** follow from the teachings in the prior art. See *The Toro Co. v. Deere & Co.*, 355 F.3d 1313, 1320 (Fed. Cir. 2004) (holding that "the district court did not address a critical question for inherent anticipation:

whether ... practicing the '516 patent necessarily featured or resulted in limitation (c) of the '168 patent."). See *Glaxo Inc. v. Novopharm Ltd.*, 52 F.3d 1043, 34 U.S.P.Q.2d 1565 (Fed. Cir. 1995) (holding that ranitidine hydrochloride is not inherently disclosed in its Form 2 crytalline polymorph in Example 32 of Plaintiff's prior patent which disclosed a method of making Form 1 crystalline polymorph, wherein Defendent practiced Example 32 of the prior patent 13 times and always made Form 2 crystals, but wherein Plaintiff made Form 1 only once by practicing Example 32).

As to inherency, the "Related Art" section of Appellants' specification on page 1, line 15 - page 2, line 6 states:

> "In the formation of cobalt disilicide, it is well known to utilize a layer of cobalt as a source for the cobalt disilicide and to use a titanium nitride (TiN) capping layer to protect the cobalt from oxidizing during a subsequent annealing step. After a first annealing step, this sacrificial TiN capping layer is chemically removed by a selective etch with a solution such as one comprising hydrogen peroxide. Discrete portions of the TiN cap are not always removed by this process, however, and a residual configuration, or "stringer," of one or more oxides of titanium, such as titanium dioxide, may remain after the cobalt disilicide is formed in a second annealing step. Unfortunately, the stringer of a titanium oxide is electrically conductive and may cause electrical shorting of adjacent structures. For example, the stringer may cause a short between the gate and the drain of an FET, between the source of a first FET and the drain of a second FET, or between the drain of an FET and external circuitry. **The prior art does not disclose a method of removing a stringer of an oxide of titanium that is generated** as described above." (emphasis added)

Since Raaijmakers does not exclude "use of a titanium nitride (TiN) capping layer to protect the cobalt from oxidizing during a subsequent annealing step", Appellants maintain that it does not

necessarily and inevitably follow from the teachings in Raaijmakers that a stringer of an oxide of titanium is not formed on the layer of cobalt disilicide.

Under 35 U.S.C. §103(a), the correct legal test is whether is obvious that "there is essentially no stringer of an oxide of titanium on the layer of cobalt disilicide" in Raaijmakers' structure. In light of the preceding quote from Appellants' specification on page 1, line 15 - page 2, line 6, and since Raaijmakers does not exclude "use of a titanium nitride (TiN) capping layer to protect the cobalt from oxidizing during a subsequent annealing step", Appellants maintain that it is not obvious that "there is essentially no stringer of an oxide of titanium on the layer of cobalt disilicide" in Raaijmakers' structure. Appellants reiterate that following statement on page 2, lines 4-6 of Appellants' specification: "The prior art does not disclose a method of removing a stringer of an oxide of titanium that is generated."

In "Response to Arguments", the Examiner's Answer argues that "there are many techniques that can be used to form the cobalt disilicide. Thus, even though Raaijmakers does not mention about stringer of an oxide of titanium, in the absence of evidence to the contrary, the skilled artisan would expect there is essentially no stringer of an oxide of titanium on the layer of cobalt disilicide."

In response, Appellants note that the Examiner's Answer has not cited any prior art that discloses even one technique of the alleged "many techniques that can be used to form the cobalt disilicide." Therefore, Appellants maintain that the preceding argument in "Response to Arguments" in the Examiner's Answer is not persuasive.

Based on the preceding arguments, Appellants respectfully maintain that in condition for

allowance. Since claims 39-41 depend from claim 27, Appellants contend that claims 39-41 are likewise in condition for allowance. Since claims 33 and 42-44 depend from claim 34, Appellants contend that claims 33 and 42-44 are likewise in condition for allowance.

In addition with respect to claims 39 and 42, Raaijmakers does not teach or suggest the feature: "wherein the reagent is not adapted to chemically react with the layer of cobalt disilicide" (claim 39); and "wherein the reagent is not adapted to chemically react with the first layer of cobalt disilicide, wherein the reagent is not adapted to chemically react with the second layer of cobalt disilicide, and wherein the reagent is not adapted to chemically react with the third layer of cobalt disilicide" (claim 42).

The Examiner's Answer alleges that the preceding feature of claims 39 and 42 is a product by process limitation.

In response, Appellants the preceding limitation of claims 39 and 42 is not a product by process limitation. Claims 39 and 34 are reciting a property of the reagent not being adapted to chemically react with the layer of cobalt disilicide, which is not a product by process limitation.

In "Response to Arguments", the Examiner's Answer argues that Appellants' preceding argument "is not convincing for the same reason as stated above since, at the final structure, as shown in Figures 10 and 18 of the present invention, there is no reagent in contact with the cobalt disilicide."

In response, Appellants assert that the language of claims 39 and 42 is not drawn to the final structure of FIG. 10, but rather is drawn to the intermediate structure described in Appellants' specification on page 9, lines 12-18 as explained *supra* in conjunction with claims 27

and 34.

In addition with respect to claims 40 and 43, Raaijmakers does not teach or suggest the feature: "wherein the ammonium hydroxide comprises approximately 4 percent of a total reagent volume of the reagent, and wherein the hydrogen peroxide comprises approximately 4 percent of the total reagent volume".

The Examiner alleges that the preceding feature of claims 40 and 43 is a product by process limitation.

In response, Appellants contend that the preceding limitation of claims 40 and 43 is not a product by process limitation. Claims 40 and 43 are reciting a 4 percent volumetric concentration of both the ammonium hydroxide and the hydrogen peroxide in the reagent, which is not a product by process limitation.

In "Response to Arguments", the Examiner's Answer argues that Appellants' preceding argument "is not convincing for the same reason as stated above since, at the final structure, as shown in Figures 10 and 18 of the present invention, there is no reagent in contact with the cobalt disilicide."

In response, Appellants assert that the language of claims 40 and 44 is not drawn to the final structure of FIG. 10, but rather is drawn to the intermediate structure described in Appellants' specification on page 9, lines 12-18 as explained *supra* in conjunction with claims 27 and 34.

In addition with respect to claims 41 and 44, Raaijmakers does not teach or suggest the

feature: "wherein the reagent is at a temperature within a range of about 45 degrees celsius to about 95 degrees celsius".

The Examiner alleges that the preceding feature of claims 41 and 44 is a product by process limitation.

In response, Appellants contend that the preceding limitation of claims 41 and 44 is not a product by process limitation. Claims 41 and 44 are reciting the reagent being at a temperature within a range of about 45 degrees celsius to about 95 degrees celsius, which is not a product by process limitation.

In "Response to Arguments", the Examiner's Answer argues that Appellants' preceding argument "is not convincing for the same reason as stated above since, at the final structure, as shown in Figures 10 and 18 of the present invention, there is no reagent in contact with the cobalt disilicide."

In response, Appellants assert that the language of claims 41 and 44 is not drawn to the final structure of FIG. 10, but rather is drawn to the intermediate structure described in Appellants' specification on page 9, lines 12-18 as explained *supra* in conjunction with claims 27 and 34.

SUMMARY

In summary, Appellants respectfully requests reversal of the June 4, 2003 Office Action rejection of claims 27, 33, 34 and 39-44.

Respectfully submitted,

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